

BRITISH
EMPIRE
SOCIETY
FOR THE
BLIND

BLINDNESS
IN
KENYA

by

R. D. CALCOTT, M.B., B.S., D.O.

Headquarters :

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1956

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LONDON,

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Copies of a film—16mm with sound track (12 minutes) entitled *Eye Doctor on Safari* produced by the Kenya Branch of the British Empire Society for the Blind, depicting a days work by Dr. Calcott during one of his surveys is in possession of the British Empire Society for the Blind, 121 Victoria Street and of the Kenya Branch P.O. Box 80, Thika, Kenya.

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BRITISH EMPIRE SOCIETY FOR THE BLIND

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BLINDNESS IN KENYA

by

R. D. CALCOTT, M.B., B.S., D.O.

*(In charge Ophthalmological Survey Kenya Branch,
British Empire Society for the Blind)*

with a Foreword by

Sir STEWART DUKE-ELDER, K.C.V.O., D.Sc., LL.D., M.D., F.R.C.S.

*(Chairman, Medical Advisory Panel, British Empire Society for the Blind,
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1956

BLINDNESS IN KENYA

FOREWORD

One of the tragedies of Africa today is the immense amount of blindness in the native populations: the tragedy becomes greater when it is realised that most of it is preventable; and it becomes more important when it is remembered that its effects are measured not only in terms of human suffering but also in incapacity, with all the economic consequences which this entails. In his present circumstances a little sight makes the average African a self-supporting individual, and with his customary adaptability and cheerfulness even the blind African can readily be taught to be independent.

In a tour of East Africa undertaken in 1949, under the auspices of the Nuffield Trust and the Colonial Office these facts and their significance were brought home to me. Fortunately, something practical is now being done about a problem which is of great Imperial significance. In 1950 the British Empire Society for the Blind was formed and settled to its immense task with enthusiasm. The first outstanding question was to assess the magnitude of the problem by surveys to discover the prevalence of eye disease, to determine its causation, to suggest medical methods of alleviation, and to experiment with schemes of social education to rehabilitate the blind who were beyond medical aid and integrate them into society. As soon as sufficient funds could be raised this work was commenced. The West African surveys are the subject of separate reports and the action of the East African Survey is described in this publication.

By December, 1952, the Kenya Branch of the British Empire Society for the Blind had raised sufficient funds to enable them to make arrangements to begin an ophthalmological survey of the Territory. It was estimated that this survey would take two years and Dr. R. D. Calcott, an ophthalmologist and the author of this report, was appointed to undertake this work. Dr. Calcott carried out his first tour in October, 1953, and completed the last in June, 1955.

The Colonial medical authorities have helped in every possible way. Arrangements were made by them to enable the survey team to use the rural dispensaries which existed in all the Districts and part of the work undertaken was to train African medical orderlies in simple ophthalmological treatment. The Society's panel of medical advisers in London has had the opportunity of considering Dr. Calcott's reports so that the results of the East African Survey could be studied in relation to those in West Africa.

Dr. Calcott's report indicates the prevalence of blindness in the wide area he covered, and brings out the striking fact that the great mass of ocular disease is determined by two causes—infections of the eye with subsequent ulceration and scarring, and cataract.

The infections are largely due to either the virus of trachoma or to purulent organisms which tend to appear in epidemic form; mostly they occur in children and their disastrous effects tend to increase throughout life. He shows how much could be prevented if medical care were given to the child population, and points out that, undertaken sufficiently early, much of the required treatment is so simple that it can be largely undertaken by orderlies under medical supervision. The treatment of cataract, is, of course, a surgical matter, but in the great majority of cases blindness thus caused can be rectified.

The Kenya Branch of the British Empire Society for the Blind may feel well satisfied with the success of its efforts and Dr. Calcott may be congratulated upon producing a very simple and satisfactory report which should greatly help the work of the British Empire Society for the Blind not only in Kenya but in other Colonial Territories.

(signed) Stewart Duke Elder.

August, 1956.

BRITISH EMPIRE SOCIETY FOR THE BLIND KENYA BRANCH

Report on the work of the mobile unit of the Society.

This report is written at the request of the Kenya Branch, British Empire Society for the Blind, and it is primarily written for their use. It is, therefore, not a scientific monograph or thesis, and an attempt has been made to exclude technical terminology. Where medical terms are used and are of such a nature that lay people will not understand them, a glossary of these terms has been compiled and will be found at the back of the report.

The Committee were quite naturally unable to supply the Unit with any clear terms of reference. The aims of the survey were, therefore, worked out in the first few months after some idea of the problem confronting the Mobile Unit had been ascertained. It was realised that the common fate of many surveys was to be relegated after their completion to a pile of statistics on some office shelf. It was therefore decided that statistics would not form the main part of this survey; also, by virtue of the amount of travelling and pressure of work, there was no opportunity for detailed research work. It was decided, therefore, that the following would constitute the aims of the Unit:

1. Training and interest. By this it was intended to arouse the interest of Medical Officers and their staff in the essentially treatable nature of many common eye conditions, and try to remove the common feeling that to treat an eye one had to be an eye specialist. An attempt was also made to train African dressers in simple diagnosis and treatment.

2. Treatment. It was decided to treat fully as many eye diseases as possible including operative treatment. This was not so much an attempt to reduce the number of eye sufferers in the Colony as rather to create interest and draw attention to the problem of blindness in the Colony.

3. Collect statistics of eye diseases causing blindness and make recommendations on their treatment.

4. Collect statistics of blindness itself and commence the compilation of a Blind Register.

5. Investigate the possibilities of some form of permanent scheme for tackling the problem throughout the Colony.

An attempt has also been made in this report to familiarise the Committee not only with the extent of blindness in the Colony, but also to explain the nature of the diseases which produce the blindness.

I would like to express the appreciation of the Unit for the unstinted support and encouragement given by the Committee throughout the whole survey. Also for the interest and whole-hearted co-operation of the Medical Department, without which no survey could even have been started, let alone completed. Special gratitude is due to the Medical Stores for their efforts to supply so efficiently all the drugs and equipment.

PART I.

THE UNIT

Direction. It was decided to organise this survey by working through the existing framework of the Medical Department. This Department has established a very comprehensive system of hospitals, health centres and dispensaries throughout the Colony. There are 32 districts in the Colony excluding the Northern Frontier District. Each of the large districts has one or more Medical Officers with a large district hospital containing up to 200 beds. Scattered through the rest of the district are often 15-20 dispensaries placed at strategic points.

Some districts have a system of health centres which are complete units under an African hospital assistant. The dispensaries are usually staffed by an African dresser. These centres are linked up by an ambulance system and are visited by the Medical Officer on his tours of the district. In Nairobi there is the main 700 bedded hospital called King George VI Hospital, and difficult cases from the rest of the Colony are referred down to this Hospital. It is also the centre of medical training for the African staff.

The Committee therefore asked the Director of Medical Services for the Colony, Dr. Farnworth Anderson, to undertake the overall direction of the Unit. He mapped out a sequence in which the various districts were to be visited. He also arranged for circulars to be sent to the various Medical Officers outlining the functions of the Unit and what was to be expected of Medical Officers in the way of support.

It was agreed that the Unit should operate for three weeks out of every month. This had many advantages in that it gave opportunity for servicing the vehicles, resting the staff and replenishing drugs. It was also agreed that a monthly progress report should be written for the information of the Committee. This report was brief, containing an indication of the amount of work done by the Unit, places visited, and the incidence of blindness encountered.

COMPOSITION

Staff. The Unit was staffed by the Ophthalmologist, a senior African assistant, a driver and a cook. At first the Medical Department supplied the assistant until the Society's own assistant could be trained specially for the work in the King George VI hospital. In addition, one extra dresser was added to the Unit in each district

visited. The Medical Officer, where possible, selected a dresser several months before the arrival of the Unit and he was sent to King George VI Hospital for two or three months training in eye treatments, and was then attached to the Unit for the period of its tour in that district. The idea of this was that the dresser should remain in the district with some knowledge of the local problems and with the intention of continuing the treatments.

Vehicles. The Society purchased a Land Rover and a 3-ton Austin chassis with single rear wheels. The Land Rover was for use by the doctor in visiting out-stations and small dispensaries, while the main transport stayed at the more central point. On to the truck chassis was built a body 6 feet high, 12 feet long and 6 feet 6 inches wide. It had a door at the rear near side and the back of the truck could open in two halves, one downwards which carried built-in steps, the other upwards, the idea being that patients could be led into the truck and treatments and operations performed inside. This was soon found to be impracticable, and throughout the safari, operations were always done in Government dispensaries or other buildings, so that these back doors were virtually unnecessary.

From each side of the truck two large tarpaulins could be drawn out to make shelter for clinical work. This again proved of little value as adequate room was always found prepared in the various sites visited. The roof of the truck carried a railing which allowed considerable quantities of light materials to be carried on the roof. In addition, 30 gallons of water were carried in tanks attached to the side of the chassis with inlet and outlet taps.

It was quite obvious from the start that the internal fittings of the truck could be one of two types—either the truck could be fitted out with cunningly-devised tables and cupboards, etc., or else the equipment could be stored in boxes which themselves could be removed from the truck. It was decided to adopt the latter scheme, and it was felt throughout the field-work that the wisest decision had been made. The only fittings in the truck were a few cupboards and drawers to contain the doctor's documents and personal belongings, and a collapsible table attached to one side. There were windows on either side of the truck 4ft. long by 1½ft. high with sliding glass in each. Also similar windows fore and aft, the latter not opening. Lighting was run off the truck battery. In addition, two large tents were carried, of the small marquee type, which were valuable for housing the staff and equipment while the doctor used the empty truck as a living room and study.

Equipment. A portable light metal operating table was carried, a general set of ophthalmic instruments and a refraction set for prescribing glasses. The usual primus stove and stands for heating water were used to boil the non-sharp instruments. At first an

autoclave was carried for sterilising theatre gowns and towels, etc., but this was found to be quite impracticable when something like 50 towels had to be sterilised every day, so that instead, sheets of plastic material 2ft. x 3ft. were carried, and these were dipped into a bucket containing a solution of mercury perchloride, and used instead of towels. This seemed to be quite satisfactory, and the sheets were dipped in the solution between each case, and where possible were dried in the sun as well. Sharp instruments were sterilised in pure dettol for one hour and then into spirit. Sterile wool and gauze were collected in drums from the main hospital of each district and replenished from there when necessary.

Several types of portable theatre lights were tried but the most successful was a detached car headlight. This never faltered or broke, despite a considerable amount of rough treatment. There were, of course, innumerable other items which need not be mentioned, but like all such safaris we found ourselves needing less and less equipment as the months went by.

Drugs. The Unit carried all its own drugs, and after a little experience it was found much better to do away with all solutions, so that all drugs were in the form of ointments, lamellae, powders tablets, etc. In these forms there was far less wastage, greater convenience whilst travelling and more effective response from treatment. The only solution carried was intravenous saline for use in irrigating the inside of the eye during some operations.

Procedure. The following is a short account of how the Unit actually worked its way round a district. The doctor in charge contacted the Medical Officer by letter two to three months before the arrival of the Unit and set up a correspondence to explain in more detail the visit of the Unit and answer any problems which may have arisen in the Medical Officer's mind. With knowledge gathered from this correspondence and the Medical Department circulars, the Medical Officer made out an itinerary of his district, usually commencing at the main district hospital. He also arranged with the Administration for the necessary propaganda and publicity, so that cases would collect at the centres decided upon. Thus the Unit would arrive at the mid-morning of, say, Monday at place A to find the outpatients already waiting. The doctor set to work immediately to examine the cases. The best method found was to line the patients in one long row and proceed from one to the other followed by the dresser of that area and the dresser assigned to the Unit from that district. These two men were instructed in the common diseases found, and simple methods of treatment which they themselves immediately began to apply.

A system of cards was used to sort out the cases. Cataract cases were given a yellow card, leucomata requiring iridectomy were given a blue card and entropion requiring operation were given a red card. Each card was stamped "R" or "L", according

to whether the right or left eye was to be operated upon. These cases were then taken aside for preparation. The blind were given a white card and set aside until they could be diagnosed and registered.

Cases requiring treatment were treated on the spot and given verbal or written instruction when to return to the dresser for further treatment. In the meantime, the Unit's own assistant was supervising the unloading of the truck and the setting up of the theatre in the dispensary itself. He was usually ready in time to supervise the pre-medication of the cases for surgery just before lunch. After lunch the operating was started. The preparation referred to consisted of a thorough washing in Cetavlon of the patient's face, and inserting Aureomycin into the eye. The intra-ocular cases received 300,000 units of Procaine Penicillin intramuscularly, and where possible Nembutal gr. $1\frac{1}{2}$ and Morphia gr. one-sixth. Very frequently the local chief or headman was present and he was assigned the job of finding room for the post-operative cases and arranging for their feeding. All operating was done under local anaesthesia, except in the case of children when a general anaesthetic was administered.

On the following day, Tuesday, the first thing done was to go out visiting the local schools. The children were inspected and received a short lecture. Further will be said about this later.

On returning from the schools, more out-patients had usually collected and Monday's procedure was repeated. Early on Wednesday, the operation cases were examined and dressed, and the dressers instructed in how to continue the dressings, and enough supplies were left with them to ensure that they could look after the cases for a period of seven to ten days. Unfortunately, sometimes patients decided not to stay and would proceed home with their bandages in place. Some of these cases were followed subsequently and many of them found to be quite satisfactory.

When the dressings were completed, the Unit packed up and moved to location B and the same procedure was repeated. If the Medical Officer requested, a further day or two was spent in any one place. On this three-day method it was found possible at full pressure to see 300 out-patients, do 30 to 35 operations and examine 500 school children. The record for such a visit was 448 out-patients, 63 operations and 909 school children examined.

When the Unit began, we carried a number of general medicines treating some of the ordinary cases that came along with the eye cases. This was soon found to be a bad policy and we definitely thereafter carried only eye medicines and turned away all other cases, except some emergency cases such as children with pneumonia. One would emphasise this point strongly as one found that the people appreciated that this was the opportunity for the

eye-sufferers, and they were very ready to wait their turn for their treatment when the Unit had passed on. The main disadvantage of trying to treat general cases at the same time is that it distracts the attention of those trying to learn from the work of the Unit and thus reduces the value of our visit. The Medical Officer himself accompanied the Unit wherever possible and the evenings in camp were very profitably spent discussing various problems and cases that had arisen during the day.

PART II

EYE DISEASES

Before considering the question of eye diseases, it is important to think about the question of treatment, as the making of a diagnosis is of little comfort to the patient with a painful red eye if no treatment is forthcoming. The requirements of successful eye therapy in the reserves and in the out-hospitals are as follows:—

1. It must be effective.
2. It must be simple to apply.
3. It must be, if possible, a once-daily treatment.
4. It must be in such a form that it is not easily contaminated or spilt.

Most of the eye medicines were found to consist of drops either of penicillin, sulphacetamide, zinc sulphate, mercury pyecatanate, or silver nitrate. The great problem with these forms of treatment is that a mother might walk five or ten miles with her child to the dispensary to receive one drop of one of these medicines and walk all the way home and naturally find little improvement, so she will not return for more. I believe this is possibly why so few dispensaries seem to have many eye cases attending them. All these drops, to be effective, need repeated application to the eye each day.

The drug that was found to fulfil all the above requirements as nearly as possible was Aureomycin ointment 3%. This is much stronger than is usually inserted into the eye and is normally a skin ointment, but on a preliminary test in about 500 children's eyes, no adverse effects were noticed and the infections treated seemed to respond satisfactorily on once-daily application; thus this drug was chosen to be the main one for treating infections of the eye. A small quantity can be put on to a glass rod (or match stick) and inserted into the outer corner of the eye with great ease. The patient feels a marked stinging sensation and declares that the medicine must be good, and in most acute cases will notice an improvement by the next day and will return to the dispensary for more. In the meantime, the Aureomycin can be kept clean

in its tube in the same way as we keep our toothpaste. The cost of the Aureomycin is, of course, considerable, but we found that one $\frac{1}{2}$ -ounce tube which costs 8 shillings 50 cents is sufficient for 150 treatments. Looked at in this way, it is possibly as cheap to use Aureomycin 3% as it is to keep four or five less effective drugs in use. It must be added, however, that the result of using 3% Aureomycin on Europeans is an intensely painful and red eye.

The main diseases to which reference will be made in the rest of this report will be found to consist of:—

1. Trachoma and its complications.
2. Purulent infections of the front of the eye.
3. Leucomata resulting from 2, and
4. Cataracts.

A short account of these diseases will, therefore, be inserted here so that the Committee may understand more fully the causes of blindness in the Colony.

With these accounts will be included some observations that were made concerning the conditions themselves.

1. Trachoma

This is a communicable virus disease usually associated with poor hygiene, lack of water and poor diet. It commonly starts in children below the age of 10 and does not produce its disastrous effects until 10 to 15 years later. Most cases of the disease, however, are self-limiting and do not progress to serious proportions. The picture commonly seen is as follows:—

Firstly, the child presents itself with watery irritable eyes which are similar to those which may be seen after a child has been weeping. This stage lasts for six weeks to two months and slowly clears up. In the succeeding years the eye becomes subject to repeated attacks of ordinary infection, and the front of the eye (cornea) may become ulcerated, or thin blood vessels may grow across it carrying with them a thin, hazy film. This film may become impregnated with pigment and assume a brown colour. Much later the scarring under the upper lid produced by the disease buckles the eyelid so that the eye-lashes turn inwards and scrape up and down against the cornea, making it progressively opaque. This turning in of the eyelid is called " entropion ". In the early stages, if the child is brought under a regime of good feeding and good hygiene, the chances of the disease clearing up without dangerous complications are very high. Nevertheless, I am convinced that even if this does happen, the disease damages some of the protective mechanisms in the eye and makes it more susceptible to harmful infections in later life.

This disease is classically divided into four stages. These stages are best recognised on the under surface of the upper lid. Briefly,

the first stage is seen as a few yellowish "grains" scattered over the centre of the lid. The second stage is when these grains have become enlarged into well-marked follicles. The third stage is where these follicles have shrunk and become scars. These scars are white and always horizontal. The final stage is where these scars have fused into one another and the whole surface is a dull whitish pink, broken up with irregular scarred patches.

It is in the first and second stage that evidence produced by the causative virus, known as inclusion bodies, can be found. Numbers of these early cases were checked by finding these inclusion bodies, making sure that what we called trachoma was what the rest of the world called trachoma.

To place any particular case into its appropriate stage requires a careful study of the subject and considerable experience. Even with this classification there are numbers of cases which seem to fall into none of the four classical groups. It became apparent during the survey that very little profit was to be gained by using this classification. Medical Officers found it confusing and could not be convinced of the purpose behind it. It will be seen at the end of this section that the classification was simplified to two stages, and these were based on a criterion of treatment. This disease is an important one in Kenya, and I feel, therefore, that simplifying its classification, although it may be unconventional, will prove of greater value to the man who in the end has to tackle the problem, namely the Medical Officer.

The treatment of trachoma is difficult and prolonged. It was, therefore, of great importance to ascertain that any drug used in the survey should be effective against trachoma.

A simple experiment was, therefore, conducted in some schools at Machakos to test out the effect of Aureomycin 3%. About 500 school children were selected and classified, but for the purpose of this report only those cases which could be followed carefully over a six-month period will be mentioned. This unfortunately only amounted to 112 children, but results were significant and paralleled less accurate but more extensive numbers which were being watched elsewhere.

Experiment with Aureomycin

In April, 1954, the school was examined and the children with trachoma classified. As a simple form of control these children were left for one month without treatment, and with two exceptions the children's eyes had not changed. They were then given 30 daily treatments with Aureomycin 3%. The ointment was applied by the teacher who had been instructed carefully in the method to be used. Treatment was commenced on May 12th and continued until June 10th. On July 19th and September 29th the cases were reviewed. The figures were as follows:—

May 12th: (Almost identical to April's examination)
 Std. = Standard in School.
 Tr. = Trachoma Stage 1, 2, 3 and 4.

	Std.1	Std.2	Std.3	Std.4, 5 and 6	Total
Tr.1.	21	14	11	6	52
Tr.1 (?)	1	1	—	—	2
Tr.2.	4	9	2	—	15
Tr.3.	9	6	10	17	42
Tr.4.	1	—	—	—	1
	36	30	23	23	112

June 10th: The following changes were noted:

Of the 52 Tr.1: 27 were cured.
 6 had advanced to Tr.2.
 5 had advanced to Tr.3.
 2 were unchanged.
 12 improved, but still showed
 some doubtful follicles.

Of the 2 ? Tr.1: both were cured.

Of the 15 Tr.2: 6 were cured
 4 unchanged.
 5 advanced to Tr.3.

Of the 42 Tr.3: 40 were unchanged.
 2 were ? improved.

On September 29th they were re-examined, and
 the position was the same as in June except that
 5 of the 12 improved Tr.1 had gone on to cure.
 All the Tr. 2 and Tr. 3 were unchanged.

It can be seen from these results that Aureomycin 3% was satisfactory in dealing with the early stages of the disease, but once stages 3 and 4 were reached, treatment seemed to be ineffective; thus, from the point of view of this report, I have divided trachoma into two stages, the first being the follicular or treatable stage, and the second the scarred or untreatable stage. Thus, from the Medical Officer's point of view, all he has to ascertain is whether the under-surface of the upper lid has spots and follicles on the tarsal plate or whether these follicles have been replaced by horizontal scars. For the first category it is well worth embarking upon daily treatment for three or four weeks. By daily treatment is meant inserting Aureomycin 3% once daily into the eye. The second category is also worth treating, if treatment is combined with general measures such as improving the patient's hygiene and standard of health, but a change in the observable condition of the eye will not be very marked in this second group.

Entropion

As mentioned earlier, this is an inturning of the upper lid due to the contraction of the scars mentioned above. This results in the eye-lashes scraping against the cornea and making it become opaque, and very often producing severe ulcers. It is possible to turn the lid outward again with a small operation. The operation we chose is called a modified Snellen's operation. It is fairly easy to perform and numbers of African dressers were taught how to do it. It can be repeated if necessary and the cosmetic effects are very satisfactory. It is hoped that every hospital and large dispensary will one day be able to perform this simple operation.

The Spread of Trachoma:

Like so many of the diseases in the tropics, trachoma is readily spread by flies. The flies make a particular point of settling around dirty eyes where the moistened mucus that has not been washed away in the morning readily attracts them. In this way they spread the disease from eye to eye; thus, any measures that seek to reduce the number of flies will also, of course, reduce the incidence of trachoma.

2. Purulent Infections of the Eye

These are infections that produce the well known painful red pussy eye, commonly known as conjunctivitis. These infections are normally spread by flies, dust, dirty hands, etc. If the infection starts in one eye it invariably spreads to the opposite eye in 24 to 48 hours. If left untreated, the infection tends to make ulcers in the front of the eye, which, when they heal, leave a permanent white scar called a Leucoma. Treatment of these conditions has to be very effective and, if possible, commenced soon after the onset of the disease. It was found that Aureomycin 3% will clear up a vast majority of these dangerous infections with three once-daily applications.

3. Leucomata

When the ulcer referred to above has healed with the resulting dense white scar called a leucoma, the scar is permanent. If it should happen to occur in the centre of the eye and thus cover the pupil, the patient will be blind in that eye. It will, therefore, be necessary to make another pupil just to the side of the scar and this operation is called an optical iridectomy. It was found that these optical iridectomies could restore useful but not very clear vision; thus they were commonly performed when both eyes were affected, because patients with one normal eye did not appreciate the extra but hazy vision restored in the damaged eye, but for a bilateral sufferer it was often the difference between useful sight and blindness. In children, when such a scar forms, the tissues are so soft that they cannot withstand the pressure within the eye and the scar bulges outward. This slowly destroys the front of the eye converting it into an irregular projection known as a staphyloma.

4. Cataracts

Every normal eye has a lens within it which is responsible for focussing and producing a clear image of any object we choose to look upon. With advancing age these lenses often become opaque and blindness results. The removal of a cataract is a highly skilled procedure, if the best visual results are to be obtained. The Unit has been frequently criticised for instructing District Medical Officers in the technique of this operation, because it has been said that more harm than good would result. I have found that in the average cases in the reserves, the final result desired usually only amounts to seeing the door of a hut or counting cattle. The technique taught to Medical Officers, and the amazing aptitude that most showed, usually ensured that this visual standard can be obtained in a high percentage of cases operated upon. It is, therefore, very important that Medical Officers should know how to remove a cataract, and be able to change their people from uselessness to independence.

School Children

It was decided that valuable information could be gathered by visiting schools and examining the eyes of the school children. This was specially important in relation to trachoma because it was possible to see this disease in its uncomplicated stages, and also get a clearer idea of its incidence in any particular district. In addition, the use of Aureomycin 3% by the school masters popularised the treatment and encouraged mothers with young children to take their young ones to the local dispensaries. It was hoped that some scheme could be evolved whereby in each district, school children could be examined, and the cases of trachoma treated. Each new intake of children could be examined and positive cases treated. Then periodical examinations, about once in two years, could be performed of the whole school. This, apart from its propaganda value, would possibly eliminate a considerable proportion of the disease. The extension of such a scheme carried through every grade of school in the Colony, would, of course, be impracticable, but it is only necessary to investigate and treat the first four standards of the primary schools as these would include the greater majority of the treatable trachomatous school children.

On visiting the school, one usually assembled all the children, heard them sing, and then delivered a short talk explaining:

1. The spread of eye diseases by flies;
2. The nature and danger of trachoma;

3. Some reference was usually made to the relationship of venereal disease to acute infections of the eye, and also the danger of drinking alcoholic drinks polluted with methyl alcohol, which appears to be not uncommon in some African villages.

Great stress was laid on the need for simply keeping the face washed, especially first thing in the morning, as a means of preventing flies being attracted to the moistened mucus secretions of the eyes that collect overnight.

It may be mentioned here that a very common complaint amongst school children in the higher standards and forms is that their eyes become painful and watery while reading or studying. This is an important problem and is constantly coming before Medical Officers. It was found to be largely due to over-anxiety and holding books too close to the eyes. This subject is discussed more fully in a separate article. It was pleasing to note the enthusiasm being shown by school masters to help their pupils with regard to the health of their eyes, and this enthusiasm can be turned to good use.

During the survey 16,563 school children were examined, of whom 1,136 were found to have trachoma.

With this preamble about the nature of the common eye diseases encountered, the statistics collected during the survey (Appendix A) can be examined. It will be noted that only trachoma, other infections and cataracts will be considered. Records of all other diseases diagnosed were made, but are not included in this report, the reason being that they are largely not preventable and are very much less numerous, and their inclusion would hinder the forming of any useful deductions by complicating the tables of figures.

Trachoma is divided into:

- (a) The follicular group;
- (b) The scarred group;
- (c) Entropion.

Other infections include:

- (a) Blepharitis;
- (b) Conjunctivitis (excluding allergic reactions);
- (c) Corneal ulcers;
- (d) Panophthalmitis, etc.

In the columns under " Incidence by Percentage ", only the figures for entropion, leucoma and cataract are noted. This does not give a true picture of the incidence, but more clearly portrays the severity of the condition. The most severe complication of trachoma is entropion, and, therefore, it is important to be able to pick out the areas where trachoma goes most readily into entropion.

Similarly, with acute infections, one wants to know where the incidence of infections producing blinding scars is highest. This simplification is designed, not so much to indicate the incidence as the severity of the diseases encountered. It can be seen from the figures, as indeed, we should expect, that where the infections are severe they are also widespread. With a colony-wide system

of treatment, however, the changes in these two conditions will be easy to ascertain because they are easy to diagnose, and thus by watching these two complications we can get a clear idea of the progress that is being made in any one district.

I would suggest, therefore, that returns of eye diseases from the districts be confined to these three diseases, coupled with the total of eye diseases found. This will simplify the work of the district hospitals, and at the same time provide a reliable method of finding out whether eye diseases of the district are coming under control.

It can be seen from these figures in Appendix A, that generally where trachoma, entropion and leucomata are most numerous, the cases of cataract seem to be fewer. It can also be seen that the former conditions are commonest in areas where rainfall is low and where the land dries up for certain months of the year. The places where cataracts are most common are found where there is a good average rainfall, e.g., amongst the highlands which are more constantly covered with grass such as the Teita Hills, and the Kericho district. I feel that the great factor in the first group, i.e., the dry areas, is not so much the dust and the flies, although of course these are important disease carriers, but rather the absence of water with which to wash. It is common knowledge that European people can go and live and work in these dry areas where the acute infections of the eye are numerous, and yet they themselves are rarely infected. I am sure it is due to the fact that they ensure for themselves adequate water for washing and personal hygiene. In the grassy areas where there is more water, there is conversely a higher degree of personal cleanliness and, therefore, a lower incidence of the infections, although there is very often a dense fly population. It also seems as though, under these conditions, the people live longer and the incidence of cases with senile cataract is, therefore, greater. The significance of these statements is that Medical Officers working in the well-watered areas will encounter more blindness from cataracts than in the dry areas. These well-watered areas, therefore, should carry with them the implications that the Medical Officer should be especially instructed in the technique of extra-capsular lens extractions.

For the dry areas the stress ought to be on the distribution of Aureomycin throughout the dispensaries and family groups with a view to eliminating the early stages of acute purulent infections. Propaganda stressing the need for face washing in the dry areas would also, I feel, be of value. It could be started in the school and thus slowly work through the tribe.

It can also be seen that the worst districts for diseases arising from acute infections are Masai, Samburu, Kitui, Machakos, Central Nyanza and west of North Nyanza. The districts where acute infections are not so important but where cataracts are the main

trouble, are Kericho, Kisii, Coast Province, and the Teita district.
Recommendations for covering these bad areas.

It was found on the present survey that the plan, outlined in the early pages of this report, of visiting a dispensary for one or two days, and concentrating solely on eye cases, produced a considerable diminution in the number of people suffering from eye diseases in that area. The result is that after such an intensive visit, this area need not be re-visited for some months. In the light, therefore, of the above figures I would suggest the following scheme:

That the Medical Officer in each of the districts mentioned visit two or three of his dispensaries twice a year, carrying out an intensive eye treatment campaign for one or two days. The following are the dispensaries I would recommend in each district for such a scheme:

Machakos	Kangundo	Coast Province	Kilifi
	Makueni		Kaloleni
Kitui	Tsikuru	Teita	Wesu
	Migwani		Taveta
Kericho	Sigor or	Masai	This needs a specially worked-out programme.
	Longisa		
	Buret		
South Nyanza	Basi	West Suk	Kapenguria
	Kadere		Kongelie
Central Nyanza	Siaya	Elgayo	Koitalal
	Ambira		Tambach
	Asembo	Baringo	El Dama
North Nyanza	Amakura	Samburu	Again a special scheme will be required.
	Bungoma		
	Butere		

Even if the dispensaries named were only visited once a year and the visit were preceded by propaganda through the chiefs, a tremendous amount of good can be done in five years.

SUMMARY OF STATISTICS

Summary of Operative Work.

In all 1,456 operations were performed by the Unit.

477 were on cases of cataract.

342 were on cases of old ulceration of the cornea.

578 were on cases of trachoma.

59 were miscellaneous.

These figures can be re-arranged under the following headings:—

678 were performed to restore sight;

749 to prevent blindness in the future or increase the standard of vision;

29 were for various other reasons, i.e., cosmetic, and the relief of pain.

The total number of cases seen was 7,747 of these:—

3,248 were normal;

4,499 were disease cases, of which

1,677 were trachomatous;

763 were the result of acute infections.

Sixty per cent. of the total were male, and forty per cent. female.

A NOTE ON SCHEMES FOR TREATMENT

It can be readily understood that the tribes of Kenya are basically divided into two types: the nomadic and the pastoral. The nomadic tribes comprise the Masai, Samburu, and the tribes of the Northern Frontier Province. The tribes in the Nyanza, Central, Coastal and Eastern part of the Southern Province are mostly settled. The nomadic tribes are of course cattle people, and the others are more interested in agriculture of one sort or another.

The problems of treating these two groups are different because in the pastoral tribes there is already a fairly well established system of dispensaries which can be fairly easily reached by most members of the tribe. Treatment in this group can therefore be fairly effectively carried out by supplying the dispensaries with Aureomycin.

This, however, will not suffice for the nomadic tribes; the only way to reach them is to have the Aureomycin made up into $\frac{1}{8}$ oz. tubes and sold or distributed amongst the family groups.

With the co-operation of the District Commissioner of the Samburu district, and the Medical Officer of the Narok district, 1,000 of these small tubes are being distributed amongst families with the hope that they will be used by parents on their children's eyes, and so cut down the incidence of untreated but devastating infections amongst children.

At the time of writing this report it is too early to say what results are being obtained from this system, but already the impression is that it is reducing the incidence of infected eyes in the areas in which it is being used.

MEDICAL OFFICER'S EQUIPMENT

Still pursuing the policy of simplifying the whole question of ophthalmology as applied to the reserves of Kenya, I would suggest that the following is all the equipment that the Medical Officer needs to be effective in his district:

1. The ability to perform three operations:

- (a) A lens extraction,

(b) Optical iridectomy;

(c) Modified Snellens.

In a further publication details of the actual instruments and techniques advised for these operations are suggested.

2. Aureomycin 3%, Cocaine 4% drops or lamellae, Atropine 1% drops or lamellae.

3. Four sets of spectacles of the following strengths: +1; +1.5; +2; +2.5.

These can be used to enable elderly literate Africans to find a suitable pair of reading glasses for themselves, the idea being that they try the various strengths in turn, one of which will suit them. They give the Medical Officer the money and he orders the glasses direct from an optician in Nairobi, and these are sent direct in the post to the African concerned. The cost is Shs. 25/- per pair of glasses complete with case.

Most people will ask, "Where is the ophthalmoscope?" but I would suggest this be replaced with a good torch.

PART III

BLINDNESS

The propaganda which was sent out by the Unit laid particular stress on the attendance of people who were totally blind, and the following are the figures relating to these cases:—

Totally Blind

The distribution of the totally blind is as follows:—

Machakos	...	...	...	...	...	...	149
Kitui	...	...	...	...	...	...	205
Kericho	...	...	...	...	...	...	90
Kisii	...	...	...	...	...	...	39
Central Nyanza	...	...	...	...	...	...	159
North Nyanza	...	...	...	...	...	...	140
Mombasa	...	...	...	...	...	...	64
Kilifi	...	...	...	...	...	...	76
Teita	...	...	...	...	...	...	25
Kajiado	...	...	...	...	...	...	39
Narok	...	...	...	...	...	...	31
Elgayo	...	...	...	...	...	...	31
West Suk	...	...	...	...	...	...	11
Baringo	...	...	...	...	...	...	9
Samburu	...	...	...	...	...	...	25

1,093

Of the totally blind the following diseases are the causes:—

Senile Cataract	...	...	...	...	477
Panophthalmitis	...	...	...	...	183
Ulceration of the cornea	...	...	...	...	182
Optic Atrophy	...	...	...	...	62
Glaucoma	...	...	...	...	50
Trachomatous Scarring	...	...	...	...	40
Non-senile cataract	...	...	...	...	25
Irido-cyclitis	...	...	...	...	23
Injury	...	...	...	...	17
Onchocerciasis	...	...	...	...	15
Retinopathies	...	...	...	...	13
Degenerative conditions	...	...	...	...	6
					1,093

Totally blind male were 689 of which 78 were under 15 years of age; 157 between 15 and 45; 454 over 45.

Totally blind female were 404 of which 62 were under 15; 141 between 15 and 45; 201 over 45.

The ratio of blind to partially blind is roughly 1 to 2. This figure is rather lower than in other countries, and I do not believe it is a true figure because of the nature of the propaganda I put out before the survey.

It can be seen from these figures that nearly 50% of the cases of blindness are due to cataract, which of course is treatable. Of the rest, nearly three-quarters of the cases of blindness were due to preventable conditions; it would, therefore, not be an exaggeration to say that 50% of the blindness in the Colony is either treatable or preventable, and the percentage is possibly higher than this.

From these few figures given in this report it is impossible, of course, to get at an exact estimate of the blind population of Kenya, but by the process of comparison with the United Kingdom and comparing the percentage of population analyses, and using the figures found in U.K. for comparison, I would estimate that there are between 65,000 and 70,000 blind in Kenya. This includes both totally blind and partially blind, i.e., those who can only read 3/60.

At the moment, my impression is that this is a problem which is only recently coming to light, and, therefore, has not had as much thought and attention as other problems. It would seem, however, that the question of blindness, and diseases leading up to it, is not as difficult as some of the other health problems to be tackled. I would be so bold as to say that, with a fairly continuous attack on the problem, in five years the blindness could be reduced by 20% if not more.

I, therefore, append a summary of the various conclusions and suggestions mentioned throughout this brief report as they have been designed with a view to effecting this reduction in the blindness that we have in the Colony.

SUMMARY OF CONCLUSIONS REACHED DURING THE COURSE OF THE SURVEY

1. That the classification of trachoma be confined to two stages, i.e., follicular and scarred (page 12).

2. That Aureomycin 3% be the standard treatment for trachoma and infections of the eye in the District Hospitals and dispensaries.

3. That at least one senior African dresser in each district be selected and trained so that he is able successfully to perform the operation for entropion under the supervision of the Medical Officer.

4. That primary school children are examined for trachoma when they are taken into school, and treated by the masters accordingly. And/or that the first four standards of the primary schools be examined every two years and positive cases treated for 30 days with Aureomycin (page 13) stress being laid on morning washing of all children's faces.

5. That returns of eye diseases consist of the following headings (page 16).

1. Total eye cases seen.
2. Number of cases of entropion.
3. Number of cases of leucoma.
4. Number of cases of cataract.

6. That Medical Officers be encouraged to do at least two eye treatment safaris a year to the dispensaries named earlier on in this report (page 19).

7. That if possible two ophthalmologists conduct tours of the Colony once a year. One to do Nyanza, Rift Valley and Coast Province, and the other to do the Southern Province.

8. That Aureomycin 3% be sold to family groups amongst the Masai and Samburu tribes (page 18).

9. Since commencing the survey, Achromycin 3% has become available. This is cheaper and equally as effective as Aureomycin and may even be less irritable. It would be used in exactly the same way as Aureomycin.

APPENDIX "A"

(See foot note)

DISTRICT	Total Cases	TRACHOMA			INFECTIONS			Total Disease cases		NORMALS	Average Rainfall Inches	SCHOOL No. in Trachoma Sch.	Entrop.	Leu-coma	Catar-act
		Total	Follic-ular	Scar-red	Entrop-ion	Total	Leu-coma	Seuile Catar-act	Total						
Machakos	204	63	10	41	12	9	4	3	79	125	20-30		15	5	4
Machakos	308	120	4	83	33	16	6	12	152	156	20-30		22	4	8
Kangundo	125	46	4	18	24	8	8	12	71	54	20-30		34	11	17
Masil	68	10	1	3	6	4	4	10	26	42	30-40		23	15	38
Mbooni	226	49	1	25	23	20	13	21	93	133	10-20		25	14	23
Makueni	68	25	3	9	13	14	10	10	49	19	10-20		27	20	20
Makindu	82								82						
Totally Blind	1,081	313	23	179	111	71	45	68	552	529		1,651	20	8	12
Kitui	200	67	9	43	15	20	14	12	111	89	10-20		14	13	11
Kitui	103	41	3	23	15	8	6	5	55	48	10-20		27	11	9
Kavi	298	76	8	38	30	27	15	12	115	183	10-20		26	13	10
Migwani	243	88	7	59	22	34	27	13	137	106	10-20		16	50	9
Tseikuru	57	26	3	16	7	17	15	5	49	8	10-20		14	31	10
Noo	129	61	10	26	25	27	24	15	104	25	10-20		24	23	14
Mutumu	55	22	3	7	12	10	6	7	43	12	10-20		28	14	16
Kanziko	23	11	1	4	6	7	5	4	22	1	10-20		27	23	18
Ikutha	146								146						
Totally Blind	1,254	392	44	216	132	150	112	73	782	472		1,538	17	14	9
Kericho	250	16	3	5	8	10	6	45	80	170	50-60		10	7	56
Sigor	225	12	2	3	7	10	5	35	60	165	50-60		12	8	58
Longisa	67	5	1	2	2	9	7	15	32	35	40-50		6	22	47
Buret	18								18						
Totally Blind	560	33	6	10	17	29	18	95	190	370		1,337	9	9	50
Kisii	64	11	2	3	6	12	8	4	40	24	30-40		15	20	10
Oyugis	33	11	1	4	6	10	2	4	27	6	30-40		22	7	15
Kabundo															
Kadera															
Njiru	33	13	2	6	5	4	2	2	24	9			21	8	8
Basi	35					16	6	6	25	10				24	24
Migori	37	3		3		2	1	2	15	22				7	13

Bukuria	358	—	—	—	—	3	1	3	8	350	40—50	—	—	13	38
Totally Blind	579	38	5	16	17	47	20	21	158	421	1,457	99	11	13	12
Central Nyanza															
Ahero	67	7	1	4	2	10	6	21	43	24	40—50	5	5	14	49
Pabonditi	127	14	3	9	2	18	9	9	62	65	40—50	3	3	14	14
Nyahara	75	12	1	5	6	17	11	17	54	21	40—50	11	11	20	32
Kajulo	29	6	3	1	2	—	—	4	14	15	40—50	14	14	—	29
Malango	53	16	2	4	10	5	3	—	32	21	40—50	31	31	9	—
Siaya	111	38	3	7	28	7	5	7	59	52	30—40	47	47	8	12
Nzoia	65	18	2	4	12	11	9	18	51	14	30—40	24	24	18	36
Ambira	40	10	1	1	8	5	3	3	20	20	30—40	40	40	15	15
Kombewa	89	8	—	7	1	9	9	14	36	53	30—40	3	3	25	39
Asembo	86	3	—	1	2	9	6	23	41	45	30—40	5	5	15	56
Manyuando	79	11	1	5	5	7	5	7	33	46	30—40	15	15	23	23
Bondo	67	7	—	1	6	7	5	10	24	43	30—40	25	25	21	42
Totally Blind	86								86						
	974	150	17	49	84	105	71	133	555	419	2,898	143	15	13	24
North Nyanza															
Hemisi	71	3	1	1	1	6	4	5	23	48	60—70	4	4	17	22
Kakamega	27	5	1	3	1	7	—	3	15	12	60—70	7	7	—	20
Bungoma	240	25	6	13	6	81	71	15	122	118	50—60	5	5	58	12
Sirisia	86	—	—	—	1	26	16	14	49	37	50—60	2	2	33	29
Amukura	448	110	10	46	54	106	63	30	261	187	30—40	21	21	24	11
Butere	141	51	3	33	15	23	16	9	87	54	30—40	17	17	18	10
Totally Blind	87								87						
	1,100	194	21	96	78	249	170	76	644	456	2,911	47	12	26	12
Mombasa and District															
Mombasa	139	10	2	2	6	13	14	61	99	40	40—50	6	6	14	61
Msambweni	30	2	—	2	—	3	2	6	22	8	40—50	—	—	9	27
Vanga	11	1	—	1	—	—	—	3	4	7	40—50	—	—	—	—
Kwale	22	2	—	1	1	1	3	5	14	8	40—50	7	7	21	36
Kinango	24	1	—	1	—	8	8	2	11	13	40—50	—	—	73	18
Samburu	36	2	—	2	—	8	3	3	17	19	20—30	—	—	18	18
Totally Blind	36								36						
	298	18	2	9	7	33	30	80	203	95	2,255	168	30	15	40

DISTRICT	Total Cases	Total	TRACHOMA Follic- ular	Entrop- ion	INFECTIONS Total	Senile Catar- act	Total Disease cases	NORMALS	Average Rainfall Inches	SCHOOL No. in Sch.	Trachoma cases	Entrop.	Leu- coma	Catar- act
Kilifi	47	3	—	1	14	11	41	6	40—50			5	5	34
Takaungu	13	2	—	2	8	7	12	1	40—50			17	58	8
Jibana	45	—	—	—	12	9	47	3	40—50			—	21	45
Kaloneni	5	—	—	—	5	3	—	—	40—50			—	15	31
Malindi	87	14	3	11	13	8	55	32	40—50			—	15	31
Totally Blind	45						45							
	242	19	3	12	52	38	200	42		744	37	2	19	26
Teita														
Voi	25	1	—	—	4	4	16	9	20—30			6	25	—
Mbololo	23	2	—	2	1	1	5	18	20—30			40	20	40
Wesu	107	3	—	3	9	5	47	60	40—50			6	11	58
Dembwa	97	8	—	3	9	8	55	42	40—50			9	15	60
Bura	89	24	—	16	13	10	51	38	10—20			16	20	20
Taveta	67	12	3	8	7	5	30	37	10—20			3	17	27
Totally Blind	4						4							
	412	50	3	27	43	33	208	204		602	4	10	16	38
Kajiado														
Ngong	113	41	11	22	23	18	78	35	30—40			10	23	9
Shambole	62	30	8	22	—	9	34	28	10—20			—	27	12
Kajiado	71	27	3	12	12	9	49	22	10—20			25	18	10
Kiu	112	52	9	30	30	22	96	16	10—20			14	23	5
Liotokitok	76	31	3	23	17	12	60	16	30—40			8	20	12
Bissel	38	21	5	12	8	7	36	2	10—20			11	19	11
Totally Blind	28						28							
	500	202	39	121	90	77	381	119		396	105	11	20	8
Elgayo- Marakwet														
Koitlial	61	22	5	11	3	1	45	16	20—30			13	2	40
Tambach	50	11	—	9	5	3	37	13	30—40			5	8	54
Totally Blind	8						8							
	119	33	5	20	8	4	90	29		389	21	9	4	42

Kapenguria	8	1	—	1	—	1	—	2	8	—	30-40	—	—	—	25
Sigor	3	1	—	1	—	—	—	2	—	—	10-20	—	—	—	—
Kongelie	38	21	—	15	6	9	6	1	33	8	10-20	—	18	—	3
Totally Blind	7	—	—	—	—	—	—	—	7	—	—	—	—	—	—
	56	23	—	17	6	10	6	5	48	8	—	320	21	13	10
Baringo															
El Dama	49	18	—	10	8	8	7	8	40	9	40-50	—	—	18	20
Emening	56	26	—	19	7	11	10	6	47	9	20-30	—	—	21	13
Maji Moto	43	19	—	11	8	3	1	—	26	17	20-30	—	—	31	4
Churo	78	44	3	35	6	17	17	2	63	15	20-30	—	—	10	—
Totally Blind	7	—	—	—	—	—	—	—	7	—	—	—	—	27	3
	233	107	3	75	29	39	35	16	183	50	—	School Holidays	—	16	9
Samburu															
Maratal	71	17	4	10	3	39	30	2	53	18	10-20	—	—	5	4
Wamba	45	20	—	11	9	17	11	—	38	7	10-20	—	—	24	—
Baragoi	42	13	—	6	7	17	15	2	34	8	10-20	—	—	21	6
Totally Blind	20	—	—	—	—	—	—	—	20	—	—	—	—	—	—
	178	50	4	27	19	73	56	4	145	33	—	School Holidays	—	13	3
Narok	91	24	6	9	9	50	39	12	90	1	20-30	—	—	10	13
Olalunga	52	31	4	20	7	18	10	3	52	—	20-30	—	—	13	6
Totally Blind	23	—	—	—	—	—	—	—	23	—	—	—	—	—	—
	166	55	10	29	16	68	49	15	165	1	—	454	105	10	9

NOTE.—When the totals for Trachoma, Infections and Senile Cataract are added together, the figure obtained differs from the figure under Total Eye Diseases. The difference is due to the fact that miscellaneous diseases (e.g. Glaucoma) encountered in each District have not been specifically mentioned but are included in the grand total of Disease Cases. Also, under Infections only Leucoma is given a special heading but the Total under Infections also includes cases of Blepharitis, Conjunctivitis, Corneal Ulcers, etc. The last three columns giving percentages of Entropion, Leucoma and Cataract have been worked out against the figure under Total Disease Cases, NOT against the figure of Total Cases examined.

GLOSSARY

Cataract	Term used in describing the lens of the eye when it has become opaque.
Conjunctivitis	An infection of the white of the eye.
Entropion	An inturning of the lids.
Follicles	Small fleshy spots about the size of a pin's head.
Glaucoma	Condition when the pressure in the eye rises above normal.
Intravenous Saline	A highly purified form of salt solution for injecting into a vein.
Iridectomy	Removing a small portion of the iris, usually as a method of making a new pupil.
Irido-cyclitis	Inflammation of the inner eye.
Leucoma	A white scar on the clear portion of the eye left as a result of an ulcer.
Onchocerciasis	A tropical infection commonly known as "river blindness".
Optic Atrophy	The shrinking and death of the nerve of the eye.
Panophthalmitis	Inflammation which has spread to every part of the eye.
Retinopathies	Destructive conditions of the back of the eye.
Staphyloma	A bulging forward of the front of the eye due to the weakening of a scar.
Trachoma	A virus infection of the eye.



The Mobile Clinic operated by the British Empire Society for the Blind (Kenya Branch).



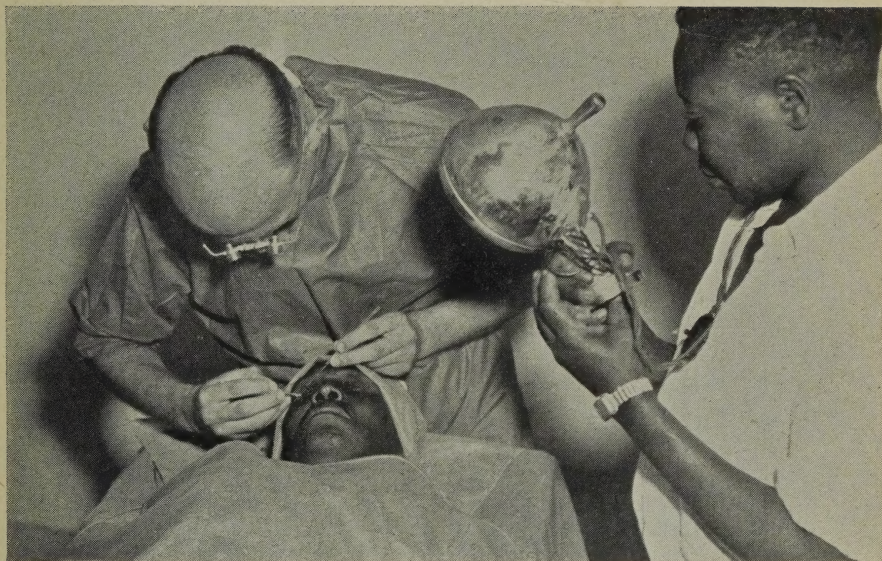
The Mobile Clinic of the Kenya Branch of the British Empire Society for the Blind parked outside a District Dispensary. A portion of the crowd of over 100 patients waiting to see the eye specialist, Dr. R. D. Calcott.



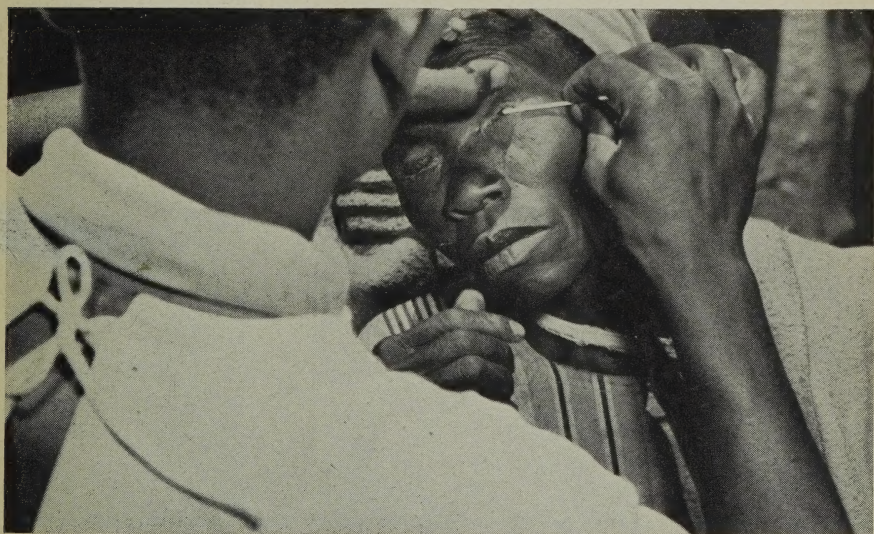
Dr. Calcott examining patients and registering cases.



Music and talks on hygiene while waiting.



Dr. Calcott carrying out an operation for cataract.



A trained African assistant administering Aureomycin ointment in a case of trachoma.

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